ANALOG TECHNOLOGY CORPORATION

GRAPHICS 810

END USER PRICE SCHEDULE

QUANTITY	MODEL 180	MODEL 190	MODEL 190-T
1 to 4	$695.00	$850.00	$995.00
5 to 9	$660.00	$805.00	$945.00
10 to 24	$625.00	$765.00	$895.00

The Model 190-L board has the same price schedule as the Model 190 plus the price of the replacement stepper motor which is projected to cost $150.00 each in small quantities.

Production deliveries for the Model 190 and 190-T are scheduled for September 1, 1981. Deliveries for the 190-L are scheduled for October 1, 1981.

TERMS:

Large firms or established customers with open account - ½% 10 days, Net 30, FOB Irwindale, California.

Overseas shipments under $1,000.00 - Draft for U.S.$, in advance, freight collect, FOB, Irwindale.

Overseas shipments over $1,000.00 - Irrevocable Letter of Credit to their corresponding U.S. bank, freight collect, FOB, Irwindale.

All others, C.O.D.

Delivery 30 days ARO.

Prices effective July 27, 1981. Subject to change without notice.

FOR IMMEDIATE RELEASE

CONTACT: Jim Lawrence
(213) 960-4004

Analog
Technology
Corporation

PLUG-IN BOARD CONVERTS TI 810 RO PRINTER TO MULTI-PURPOSE RASTER GRAPHICS PLOTTER AND SOFTWARE CHARACTER PRINTER

Analog Technology Corporation's new 190 series graphics conversion boards provide the Texas Instruments 810 RO printer with raster graphics plotting capability, a user-defined software font, and alternate report-quality fonts.

Digital Engineering, Sacramento, California, has announced that the firmware in their Retro-Graphics convertor boards for the DEC VT-100 and new TI 940 video terminals supports the ATC-equipped TI 180 as a plug-compatible graphics hardcopy device.

The new Model 190 Series graphics conversion boards are companion products to the highly successful Model 180 introduced last year for general raster graphics and special-character printing. The Model 190, however, uses a Z80 processor with 16K RAM and 16K ROM that performs all input data handling and assembly functions, leaving the 810's 8080 processor free for efficient printhead control and substantially increased plotting speed. The 190 series boards provide bi-directional, seven-row, raster graphics plotting in two operational modes that define the manner in which the plot buffer is loaded. A 9,000-character buffer allows true instantaneous transmission rates of 9600 baud without interrupt, six times higher than a normal TI 810, and contributes to substantial savings in host CPU time. A 96-character software font allows the user to define and download his own characters for printing of barcode, APL, other

languages, etc. Escape commands allow reduction of print-head speed to obtain true 120-dot-per-inch horizontal resolution and, through repeat overpass, produces an enhanced quality character print with true descenders.

Another Model, the 190-L, provides all 190 features and also allows the user to select between six letter-quality fonts. This entails the simple installation of a special high-resolution paper-advance motor that provides the greater verticle dot addressibility necessary for dot blend.

The 190-T allows the TI 810 to serve as a low-cost, plug-compatible, hardcopy device and serial printer for Tektronix storage tube and raster-scan graphic terminals. The 190-T equipped 810 emulates the Tektronix 4631 and 4611 hardcopy devices, but with a copy cost of only ¼¢ per page.

Texas Instruments has announced that they will honor service warranties on all 810 printers containing the Model 180 graphics conversion board due to its plug-in, no-modification feature. Analog Technology anticipates that similar approval will be obtained for the new 190 Series boards.

7-29-81

FOR IMMEDIATE RELEASE

CONTACT: Jim Lawrence
(213) 960-4004

Analog Technology Corporation

LOW-COST HARDCOPY FOR TEKTRONIX GRAPHIC TERMINALS PROVIDED BY PLUG-IN BOARD FOR TEXAS INSTRUMENTS 810 RO PRINTER

Analog Technology Corporation's new Model 190-T plug-in graphics conversion board allows the highly reliable Texas Instruments 810 RO matrix impact printer to serve as a low-cost preview hardcopy device for Tektronix graphic terminals. The ATC equipped 810 emulates the Tektronix 4631 and 4611 hardcopy units but it also has a Serial RS232 port which provides 150 characters-per-second printing at rates to 9600 baud, complemented by a 9,000-character buffer. Other features include a 96-character software font, two report-quality fonts, and a selectable expansion for all print and plot functions.

An end-user total system price of $2,870.00 for the TEK-copier 810 compares favorably with the $4,400.00, or greater, price range for copiers offered by Tektronix and others. Additional savings are provided since the system printer function is also provided by the 810. The 14-inch X 10.5 inch printout is more in scale with the graphics. CRT dimensions, and a ¼¢ copy cost offers cumulative savings when compared to 4¢ to 30¢ for other copiers.

The new Model 190 Series graphics conversion boards are a companion product to the highly successful Model 180 introduced last year for general raster graphics and special-character printing. The Model 190, however, uses a Z80 processor which performs all input data handling

and assembly functions, leaving the 810's 8080 processor free for efficient printhead control and substantially increased plotting speed. A 9,000-character buffer allows true instantaneous transmission rates of 9600 baud without interrupt, six times higher than a normal TI 810, and contributes to substantial savings in host CPU time. A 96-character software font allows the user to define and download his own characters for printing of barcode, APL, other languages, etc. Escape commands allow reduction of print-head speed to obtain true 120-dot-per-inch horizontal resolution and, through repeat overpass, produces an enhanced quality character print. The 190-T also provides bi-directional, seven-line, raster graphics plotting in two operational modes that define the manner in which the plot buffer is loaded.

The 190-T is plug-compatible with all Tektronix graphic terminals containing the hardcopy option which support the Tektronix 4631 and 4611 hardcopies.

Texas Instruments has announced that they will honor service warranties on all 810 printers containing the Model 180 graphics conversion board due to its plug-in, no-modification feature. Analog Technology anticipates that similar approval will be obtained for the new 190 Series boards.

End-user price for the Model 190-T, the Tektronix Copier version, is $995.00.

7-28-81

OMNI-GRAPHICS

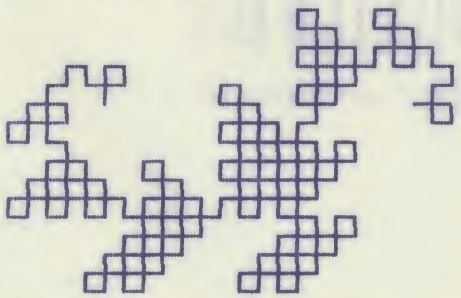
ANALOG TECHNOLOGY CORPORATION

proudly announces its plug-in board which enhances the versatility of the fast reliable TEXAS INSTRUMENTS 810 RO printer by providing graphics and custom character print capability. In addition to standard 810 RO printing, the user may utilize two plot modes and may define his own 75 character software font for custom uses. As an example, consider:

$$2\int_0^{\infty} \cos(z\cosh(x))dx = -\pi N_0(z)$$

A simple escape sequence issued to the printer will allow plotting of subsequently transmitted bytes of data. For example, the output of a monochromator:

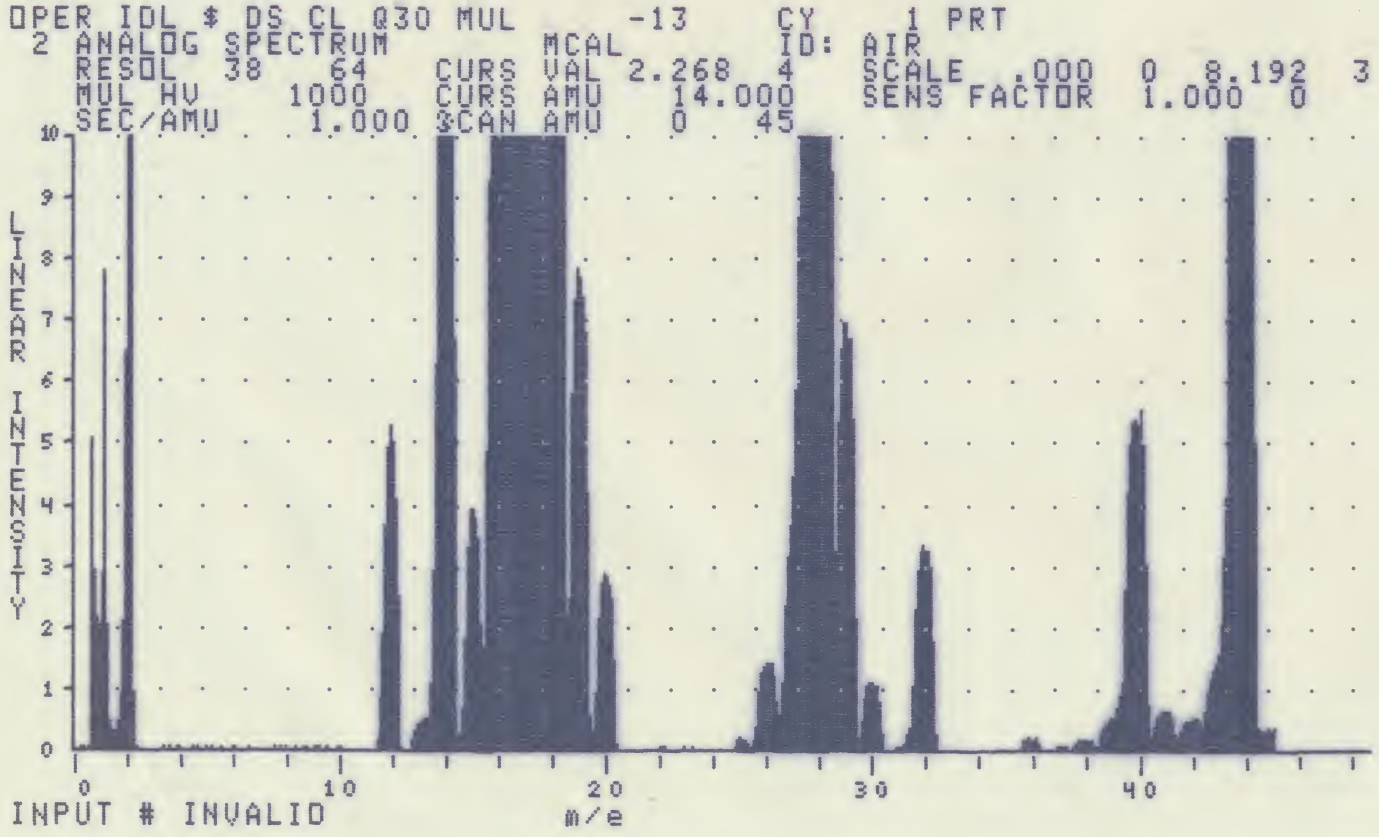
Software characters can also be used for graphics generation. For example, the character set: - ' ¬ r └ ┘ + is used to draw a DRAGON recursive structure of order 7.



No electrical or mechanical modifications of the 810 are required. The TI810 RO and OMNI-GRAPHICS cost much less than slower printer-plotters. For further information contact:

Analog Technology Corporation
15859 East Edna Place Irwindale, California 91706 (213) 960-4004

5/80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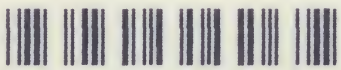
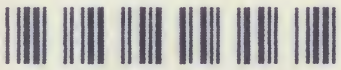
MUL HV 1000 CURS AMU 14.000 SENS FACTOR 1.000 0
SEC/AMU 1.000 SCAN AMU 0 45
LINEAR INTENSITY
0
1
2
3
4
5
6
7
8
9
10
0
10
20
30
40
m/e
INPUT # INVALID

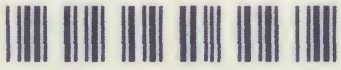
TI 810 Barcode Printout using
the OMNI-graphics software character font.

YOU CAN PRINT  ON BOTH SIDES

* 0 1 2 3 *

You can print  on BOTH sides

* 7 4 5 6 *

Code 39  Patterns

* 8 9 3 9 *

SUMMARY SPECIFICATION

For The

ANALOG TECHNOLOGY CORPORATION

OMNI-graphics CONVERSION BOARD

FOR THE TI 810 RO PRINTER

Functional Description

The OMNI-graphics Board contains 4K bytes of ROM and 4K bytes of RAM, plus support chips to provide an interface to the 810's processor and plugs into the XA3 card slot normally reserved for the line buffer option. The ATC firmware supplants the 810 processor's entire program except for the stored ASCII characters and allows the 810 to respond to commands that activate two plotting modes, user-defined software character printing, and selectable expansion of print or plot data. An additional ROM containing 512 bytes is provided which plugs into an empty slot on the processor board to support the vertical format, forms length, and/or compressed print versions of the 810.

About 3K bytes of the on-board RAM is used for two 7-row X 1584 dot buffers that facilitate assembly of the data bytes for plotting or printing up to the full 13.2 inch width at any desired length. These two buffers are used in a ping-pong fashion to improve overall printing and plotting speed since one buffer is being loaded while the other is being printed; the buffer swap is transparent to the user. The buffers are examined to provide shortest path travel and maximum acceleration for the printhead. Compensation for print-wire response time is incorporated in the firmware.

Features of Operation

The 810 will respond to standard ASCII control codes which enable the following operations:

H-PLOT: The horizontal plot mode is entered when the host transmits an Escape H. The host system then shifts the plot bytes, 8 bits at a time, no parity, in a horizontal pattern to the printer. The bytes are automatically assembled in buffer and printed in rows of selected width, 7 rows at a time, with bit 0 of each byte at the left, followed by bits 1 through 7. When the printer plots the specified number of bytes, it returns to the print state.

V-PLOT: The vertical plot mode is entered when the host transmits an Esc P. The printer then assembles and plots the following bytes in adjacent columns, with bit 0 at the top print wire and bit 6 at the bottom. Bit 7 may be used for parity, but is not plotted. The 810 tab functions may be used with V-PLOT mode. When the buffer is filled to the selected width, the data is automatically printed.

Expansion of Print and Plot: The byte following an Esc E sets the horizontal expansion factor between 0 and 127. All subsequent print (hardware and software fonts) and plot data are expanded by that factor until reset.

Software Character Font: An Esc F allows the user to load his own font of up to 75 characters, each based on a 12 x 7 grid. The loaded characters may be recalled for printing by use of a SHIFT OUT command, followed by the ASCII character code identifier for each character to be printed. Shifting between the hardware and software fonts may be done on an individual character basis by alternate use of shift-in, shift-out commands. Applications include foreign-language fonts, math characters, true descenders, and barcode printing.

Printing and Format: All TI printing, format, forms length control, and compressed print features and commands are preserved. All Texas Instrument commands covered in the 810 RO manual are supported.

Plotting Operations: Preceding the use of V-PLOT or H-PLOT mode, the line width is set by an Esc W, followed by two bytes, whose low-order 7 bits determine the image width between 1 and 1584 dots. Alternatively, the Plot width may be set in terms of 0 to 127 characters by an Escape : followed by 1 byte. The V-PLOT or H-PLOT Escape command is then sent, and the 14-bit integer specified by the low-order 7 bits of the next two bytes determines the total number of bytes (16,384 max.) in the block of image to be printed. The printer then detects line overflow to perform horizontal byte assembly and to initiate automatic printing for both horizontal and vertical modes. It lapses to the print state when the total byte count is exhausted.

Plot Resolution and Aspect Ratio: The TI 810 RO is a 7-wire impact matrix printer with a plotting resolution in dots per inch (dpi) of 120 horizontal by 72 vertical. The user may compensate for this asymmetry by properly scaling his data or achieve partial compensation by use of the expansion factor. If this is not practical, ATC will supply a version of the board containing a squaring algorithm that makes the 810 appear as a 72 x 72 dots-per-square-inch plotter at the expense of plotting speed. Escape commands allow horizontal mode plotting at either 120 x 72 or 72 x 72 dpi, and the V-PLOT mode and test pattern are deleted. The other features are the same. To order this version specify 72 x 72.

Data Interface: The standard RS 232 asynchronous serial interface at rates selectable between 110 and 9600 or the optional Centronics compatible parallel interface (PLT option) may be used.

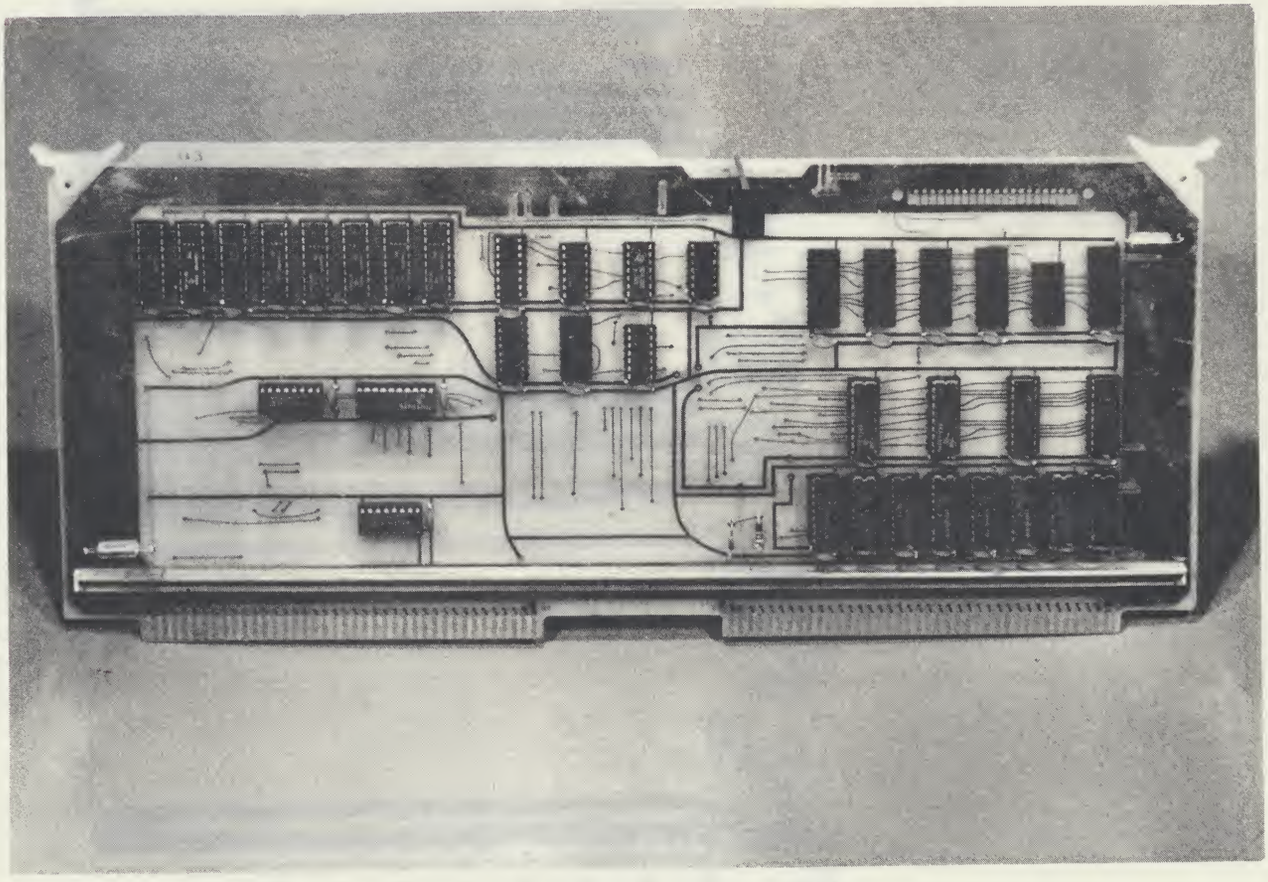
Installation: OMNI-graphics plugs into the rear XA3 card slot normally reserved for the line buffer option. An additional ROM plugs into the empty U55 socket on the processor board in FCO, FLC, VCO, or VFC models. No modifications are required.

Internal Test Pattern: With the VFC-Test switch in the test position, pressing the on-line button gives the ATC test pattern. The same operation, after flipping a switch on the board or removing the board, will provide the TI barberpole.

Warranty: Analog Technology Corporation warrants the OMNI-graphics board unconditionally for one year from date of shipment from the factory and will turn around any board within 24 hours of its receipt at our factory. All boards are burned-in for 400 hours before delivery. Boards requiring repair after the warranty period will be repaired for a fixed fee.

Texas Instruments will honor service warranties on all 810 printers using OMNI-graphics board with exception of the printhead. They state that the printhead duty cycle for full-page character printing is greater than that in typical graphic applications, and printhead life should not be reduced. However, since they cannot control the nature of the customer's application (i.e., full black pages), they will not warrant the printhead in graphic applications.

THE ATC OMNI-graphics BOARD



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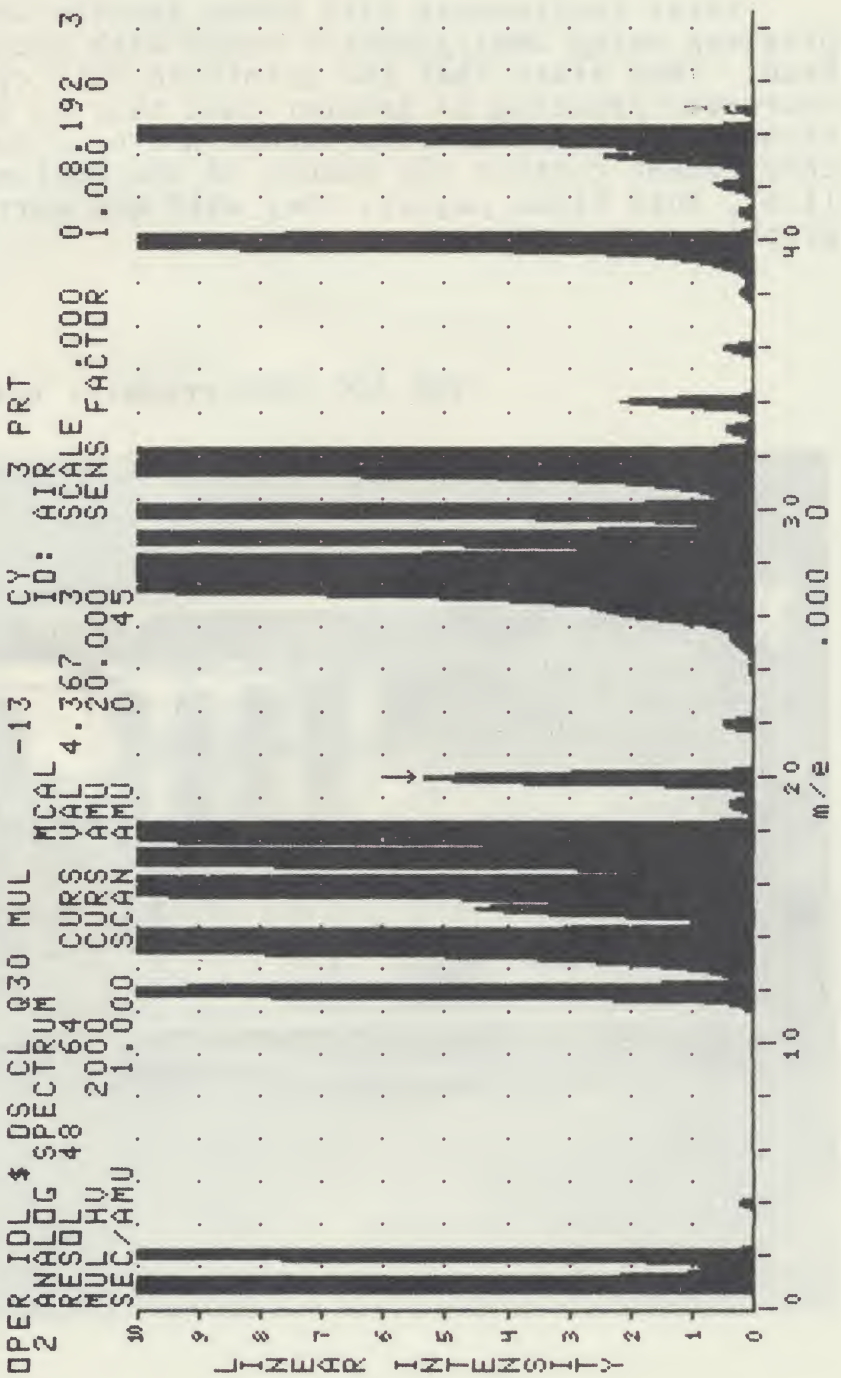

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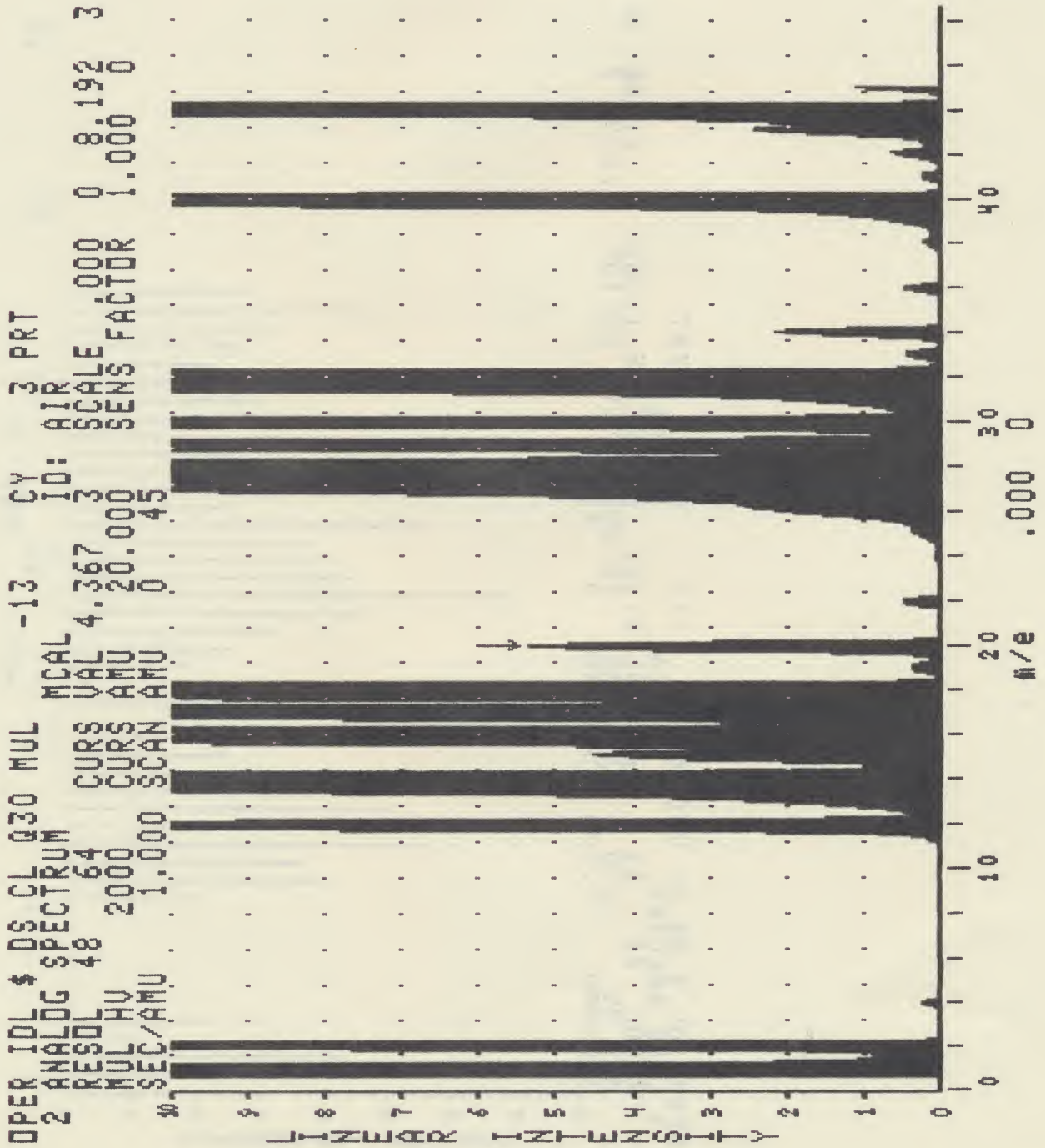

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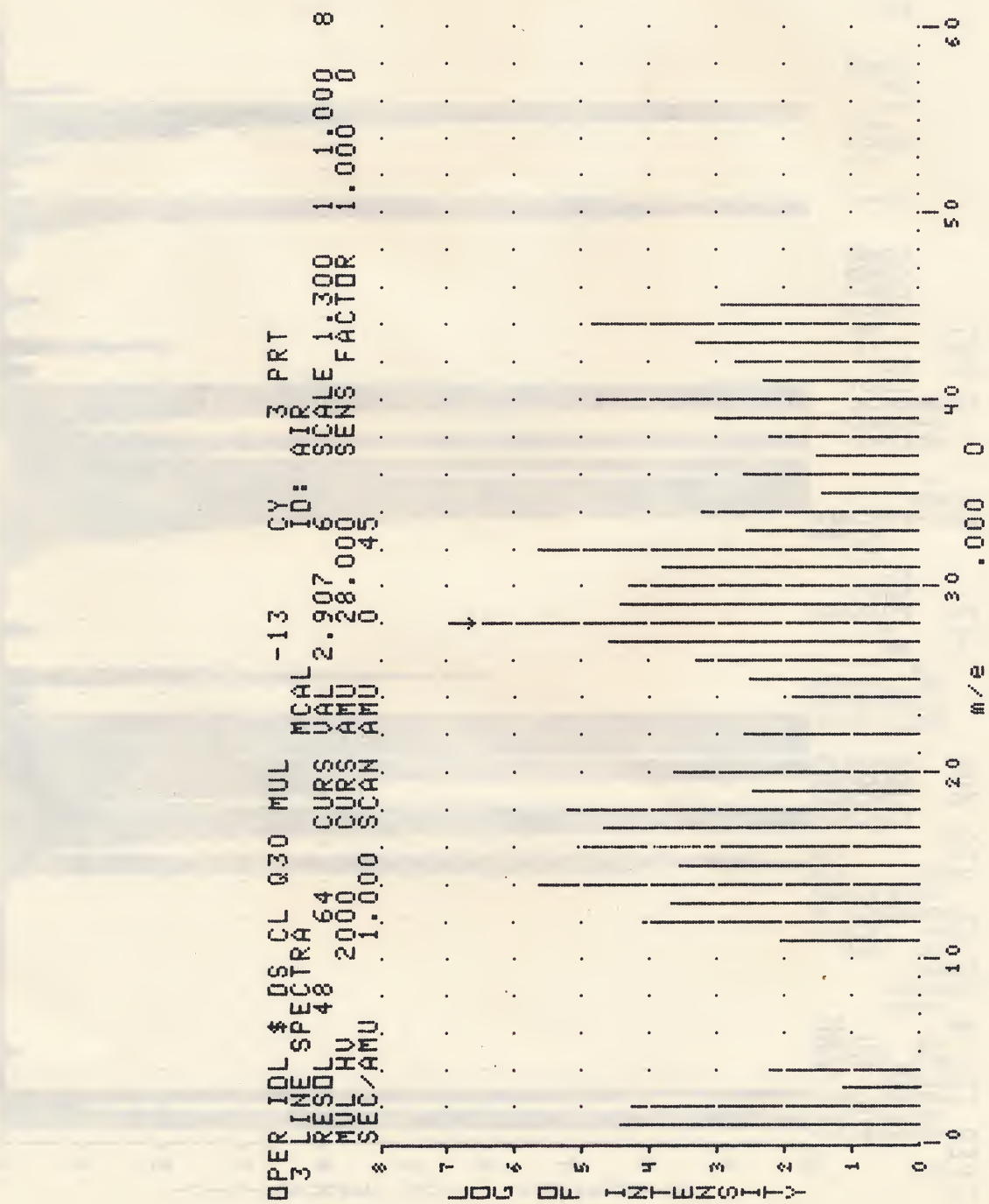
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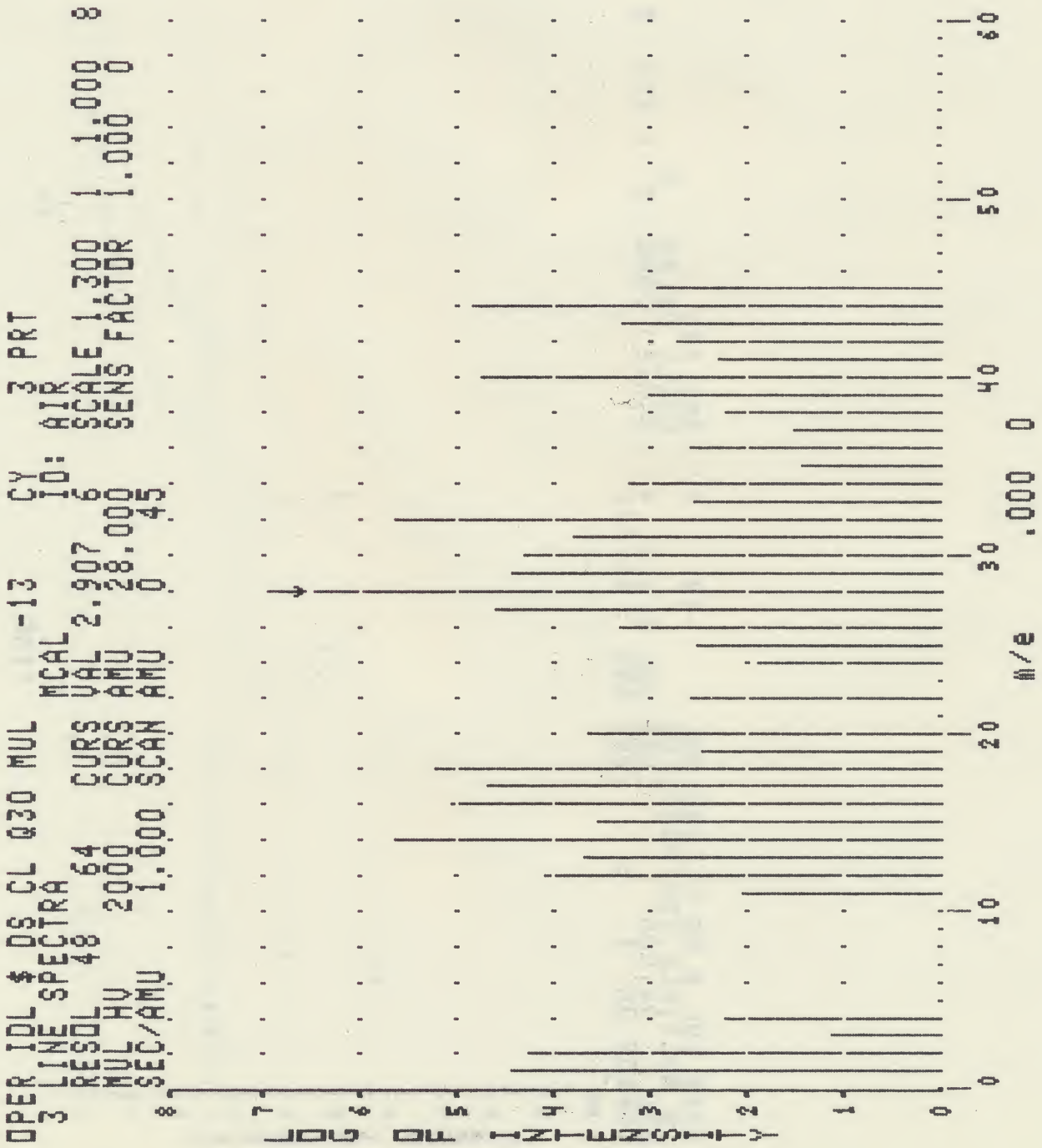
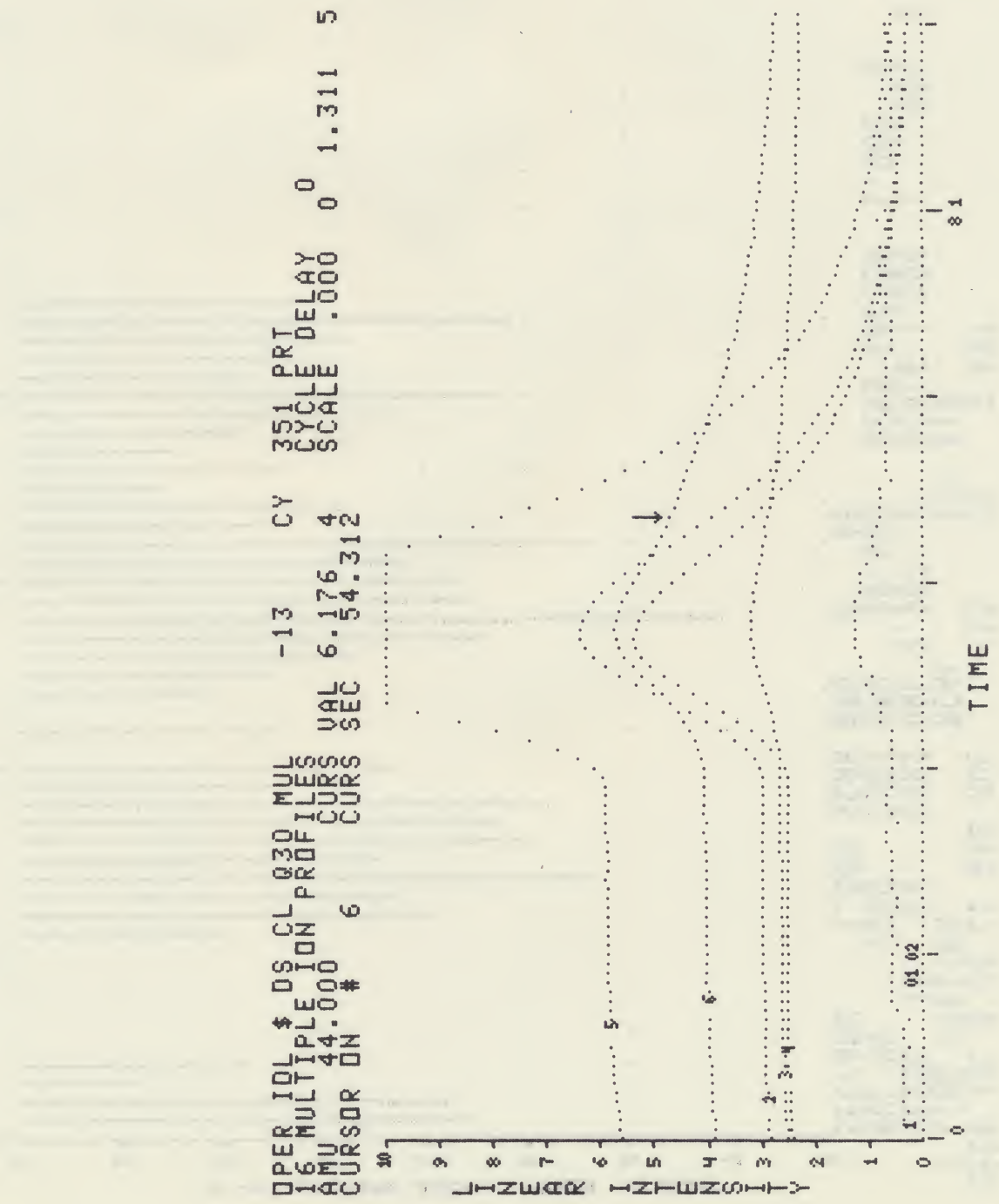
RESOL 48 2000 CURS AMU 28.0000 SENS FACTOR 1.000 0
MUL HV 1.0000 SCAN AMU 0 45
SEC/AMU
LOG OF INTENSITY
m/e
.000

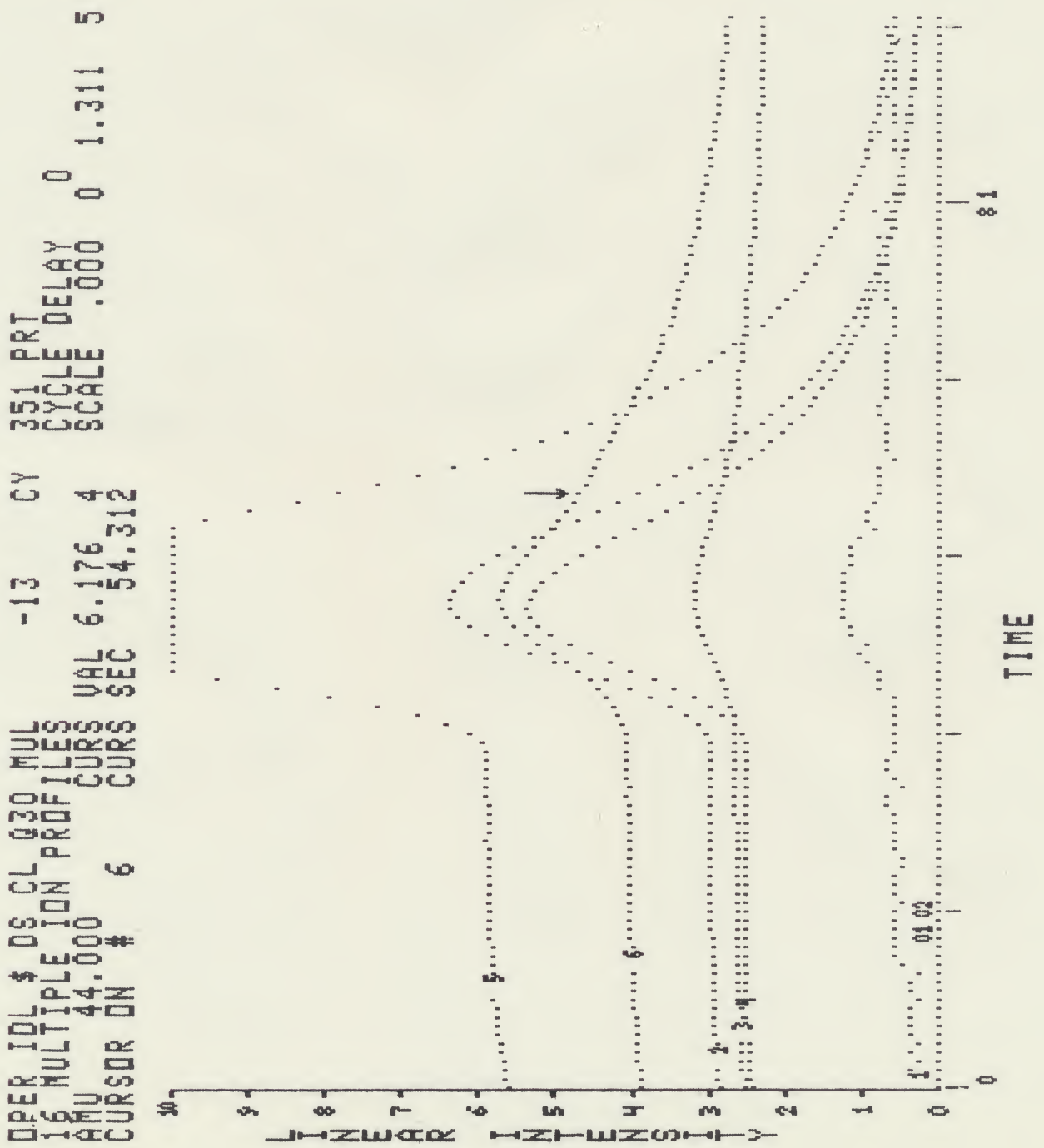
44 seconds

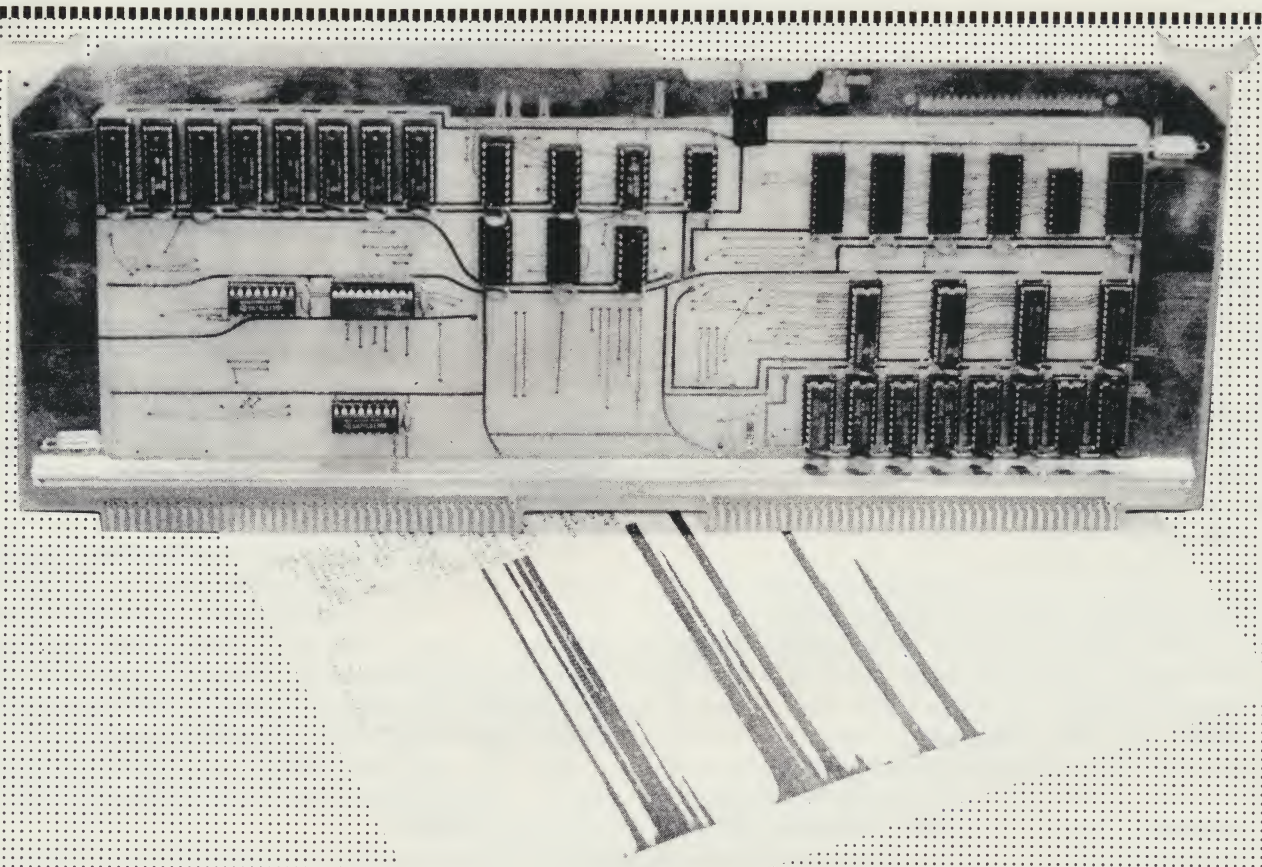

OPER IDL $ DS CL Q30 MUL -13 CY 3 PRT
3 LINE SPECTRA MCAL ID: AIR
RESOL 48 64 CURS VAL 2.907 SCALE 1:300 1 1:000 8
MUL HV 2000 CURS AMU 28.000 SENS FACTOR 1.000 0
SEC/AMU 1.000 SCAN AMU 0. 45.
JOG OF INTENSITY
0
10
20
30
.000 0
M/e
40
50
60

35 seconds 2X1



44 seconds 3X1





A Business Printer Goes Graphic

by Tom Fox

Texas Instruments' TI810 has a solid reputation for being a printer you can rely on. Originally designed to print airline tickets, the system is fast for a serial unit: 150 characters-per-second. It utilizes a dead simple dot matrix design and enough electronics to rank it among the smartest of the under-$2,000 paper gobblers. By itself, though, it only knows one kind of output: straight Ascii numbers and letters, upper and lower case. It makes no pretense at anything fancier.

Enter Analog Technology Corp. (Irwindale, CA), a young company that builds laboratory test and data reduction computers. Its machines routinely correlate thousands upon thousands of experimental test readings and combine them into human-readable charts and graphs. Output is generally to graphics terminals of Tektronix, Hewlett-Packard or Digital Equipment variety. This is fine for instantaneous reading and results interpretation, but a problem rears its head when the researcher wants a hard copy.

The problem is an old one: money. Once you've paid the price of a Tektronix graphics display terminal, there is often too little left in the treasury to purchase the hard copy attachment. Many laboratories make do with Polaroid shots of the terminal screens, but the resulting small photograph is usually unsatisfactory to record an experiment for posterity. A better way is needed.

The engineers at ATC started poking around inside a TI810 printer, and discovered that there is no mechanical reason the device should limit itself to banging only letters and numbers onto the page. With a little intelligent guidance, the print hammers could be coerced into making a pattern of black dots *anywhere* on the paper. In fact, an entire sheet could be blotted out under black ink.

It turns out that the printer has a spare slot for a circuit board, and nearly all of the picture-making smarts will fit nicely onto that extra board. ATC sells such add-in circuit boards, along with a replacement ROM chip to substitute for one on another part of the internal printer circuitry.

Installation could hardly be simpler, the results are spectacular. Because the printing hammers are tiny and the 11-in by 11-in paper so large, over 1.6 million dots can be individually addressed on a single sheet. That's a resolution of 120-dots-per-inch horizontally and 72-per-inch vertically. Picture clarity is equal to

many of the display terminals installed in this kind of computer system. Don't look for multi-color capability in this printer/plotter, however. That costs a lot more money, and few specialized printers and plotters have that field all to themselves.

It seems strange to apply the term "raster scanning" to a printing mechanism, but that's how the ATC/TI810 hybrid works. TI didn't anticipate a need to roll the paper backwards when it designed the TI810, so pictures must be drawn from the top down *only*. It's up to the programmer to come up with a way to format an image of the picture in memory first, and then dump it to the printer a single row of dots at a time. The technique is akin to the refreshing sweeps on an ordinary raster-scan CRT. The big difference is that the image only has to be scanned once—the persistence of ink on paper is *very* long. Writing graphics software is always a tedious, demanding task, and this is no exception. We would expect a Basic or Pascal-only programmer to face some tough challenges trying to produce pretty pictures. Perhaps someone will come up with a set of assembly-language routines to ease the task.

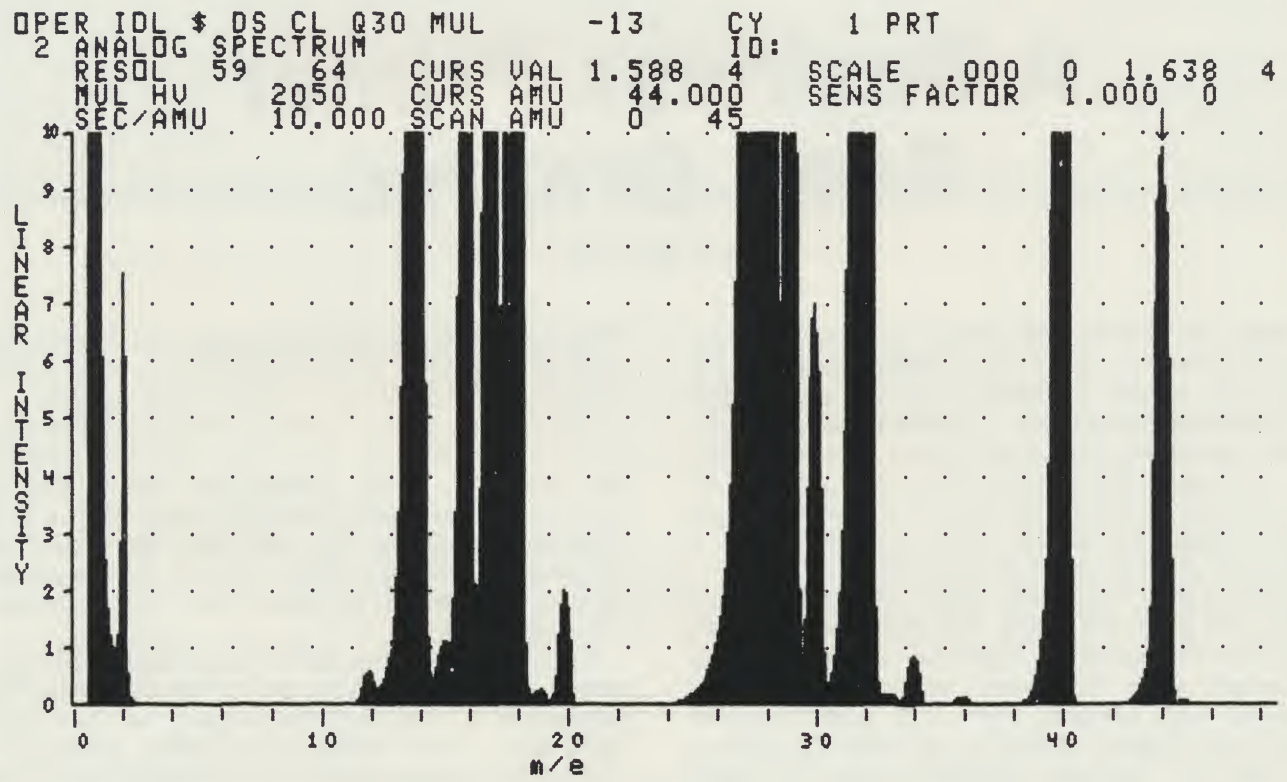
One of the add-on board's tricks seems unique enough to justify the cost by itself, and it isn't even in the graphics category. The unit has a mode where it will "listen" for the computer to define a special character set. Each character can be anything that will fit into a 7 by 12-dot matrix, and a different character can be loaded for each of 75 Ascii character codes.

Once the character set has been defined, subsequent transmissions to the printer cause new characters to print whenever normal Ascii codes are transmitted to the device. We can envisage an application where this could be used to print rough drafts of typeset material for proofreading—with a close approximation of the type fonts appearing much as they would in the final typeset form. Foreign languages and scientific formulas would be a natural, as would APL program listings. These tasks are nearly impossible on ordinary printers.

According to the manufacturer of the add-on board, TI has seen the device in action, and has agreed to honor the factory warranty of any TI810 equipped with it—except for the dot-matrix print head itself. There's no doubt that the head *could* work a lot harder drawing pictures than printing letters, and such abuse is highly dependent on the kinds of pictures being drawn. We wouldn't bet against the basic ruggedness of the TI mechanism, however.

ATC says that substantially all of the TI810's native printing talents are undisturbed—the new graphics capabilities are add-on features only. You don't have to sacrifice a good printer to get this picture capability. Just turn on the features by software commands as they are needed. ATC calls its product the Omni-graphics board, and it comes with a 28-page manual for $875.

Tom Fox can be reached at FoxWare Systems Corp., 17925-G Sky Park Circle, Irvine, CA 92714, (714) 957-9332. □



Graphics output of TI810/ATC system.

Reprinted from INTERFACE AGE Magazine February 1981
16704 Marquardt Avenue, Cerritos, CA 90701

$800

THE GRAPHICS 810 SERIES OF PLUG-IN GRAPHICS CONVERSION BOARDS FOR THE TEXAS INSTRUMENTS 810 RO PRINTER

Analog Technology Corporation now offers a series of plug-in graphics conversion boards for the fast and highly reliable TI 810 RO printer. All models offer raster graphics plotting in two modes and feature a user-defined custom software font. No modifications to the TI 810 are required as the board plugs into the rear XA3 slot and all of the printer's functions are maintained. Data may be transmitted at rates to 9600 baud on the serial RS 232 interface or over the optional TI Centronix-compatible parallel interface. ATC will be pleased to quote on special escape sequences or custom character sets desired by a user or OEM for quantity purchases. The various models and their respective performance features are as follows:

GRAPHICS 810 - MODEL 180

General Raster Graphics and Software Character Printing

The Model 180 contains 4K ROM and 4K RAM and reprograms the 810 to perform raster graphics plotting using a dual 1584 X 7 row dot buffer in either of two modes, vertical or horizontal, which differ in the manner the buffer is loaded. The escape sequences, controlling operation of the board, are described in the enclosed summary specifications for the Model 180. The Model 180 will plot a 512 X 256 matrix in 34 seconds.

The Model 180 also features a 75-character software font, each character based on a 12 X 7 grid, which can be exercised on an alternate character basis, if desired, with the hardware font. A variable expansion command allows automatic expansion of the plot data and/or the hardware and software fonts.

The raster plot and software font escape sequences are identical for all models in the Graphics 810 series.

GRAPHICS 810 - MODEL 190

Highspeed Raster Graphics, Custom Software and Hardware Fonts

The Model 190 series boards contain a Z80 processor and 16K or RAM and 16K of ROM, thus making the 810 a two-processor printer. This enhanced capability provides substantially higher plotting speed and additional performance features. The Model 190 will allow the 810 to plot the 640 X 480 raster of Digital Engineering's Retro-Graphics conversion for the DEC-VT100 or the TI 940 video terminals in just 40 seconds. Digital Engineering has incorporated the Graphics 810 escape sequences into their firmware, thus making the TI 810 a plug-in hardcopy device. The Model 190 contains a 96-character user-defined font and a 9,000-character print buffer which facilitates burst-rate transmission and reduces host CPU time.

Special escape sequences provide for selection of two additional letter fonts as alternates to the standard TI font. A special monocase font, printed by a two-pass overprint, offers report-quality text or the user may select a special font featuring true descenders which is performed as a four-pass overprint. The structure of these fonts provides an attractive appearance when the expansion feature is excercised.

GRAPHICS 810 - MODEL 190-L

Highspeed Raster Graphics and Letter Quality Print

The Model 190-L retains all the features of the Model 190 and through the simple installation of a special high-resolution paper advance motor (288 dpi), will provide a selection of six letter-quality fonts. The fonts are printed in a multiple overpass operation utilizing a half-step paper advance to provide blending of the dots and improved print quality. The 190-L is ideal for applications where a combination of high-speed printing and letter-quality printing is further enhanced by the raster graphic and software character features common to the 190 series.

GRAPHICS 810 - MODEL 190-T

Tektronix Hardcopy Emulator

The Model 190-T contains special programs and circuitry that allows the TI 810 to emulate the Tektronix Model 4631 and 4611 preview hardcopy units. Thus, the 810 is plug-compatible with any Tektronix direct-view storage tube or raster-scan graphics terminal containing the hardcopy output option that supports the above hardcopy units. This includes the entire 4010 series, the 4025, 4052 and the new 4110 series.

The control signals that interrogate the TEK graphics terminal appear at a 15-pin, D connector at the rear 810 port normally reserved for the parallel interface option. Miniature switches on both sides of the connector allow the user to select hardcopy of either a raster scan or storage tube terminal and to select the format size to fit on 8½" X 11" or 15" X 11" standard computer paper. Graphic material with complex structure is best shown on the 15" X 11" paper.

An end-user total system price of $2,780.00 for the TEK-copier 810 compares most favorable with the $4,400.00 to $4,900.00 price range of copiers offered by Tektronix and others. Additional savings are provided since the 810 still serves as a 150 character-per-second printer through use of its serial RS 232 port. Also, the ¼¢ per copy cost for the 810 provides cumulative savings when compared to 4¢ to 30¢ for other copiers.

The 190-T also provides the general raster graphics, selectable software and hardware fonts, and 9,000-character buffer features of the Model 190. The one exception is that use of these features is only available through the serial port.